Pump-probe photodetachment spectroscopy on small transition metal clusters

M. Neeb*, N. Pontius*, G. Lüttgens, P.S. Bechthold, and W. Eberhardt*1
Forschungszentrum Jülich GmbH, IFF, 52425 Jülich, Germany
*new address: BESSY mbH, Albert Einstein-Str. 15, 12489 Berlin

We report on femtosecond pump-probe photoelectron spectroscopy on free mass-selected metal clusters and metal carbonyl clusters. We will show that time-resolved photoelectron spectra of optically excited Pd, Pt and Ni clusters reveal effective electron relaxation times of about 100 fs. Moreover the electron relaxation times depend on the size of the clusters as will be discussed for small Pd clusters. In case of chemically reacted transition-metal carbonyl clusters, thermally induced CO-desorption has been resolved. Sequential energy dissipation steps between the initial photoexcitation and final desorption event, e.g. electron relaxation and thermalization have been resolved on a fs and ps scale. From an analysis of the time-dependent photoelectron distribution it is obvious that the primarily excited electronic state is fully thermalized before a CO ligand evaporates.